Technological Interventions are key to Achieving Sustainable Food & Nutrition Security in Asia-Pacific Region

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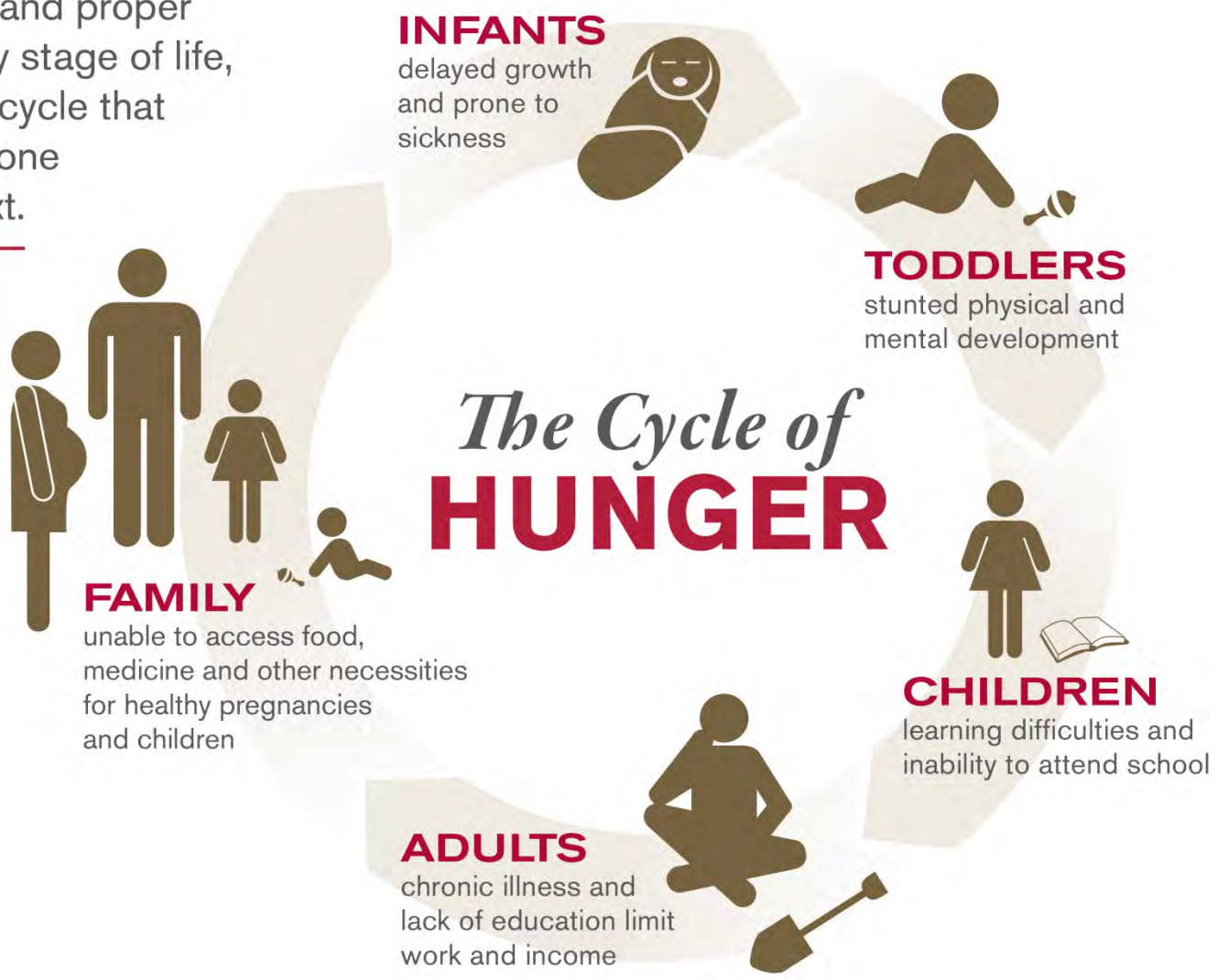
Hunger and Poverty is Inter-Generational

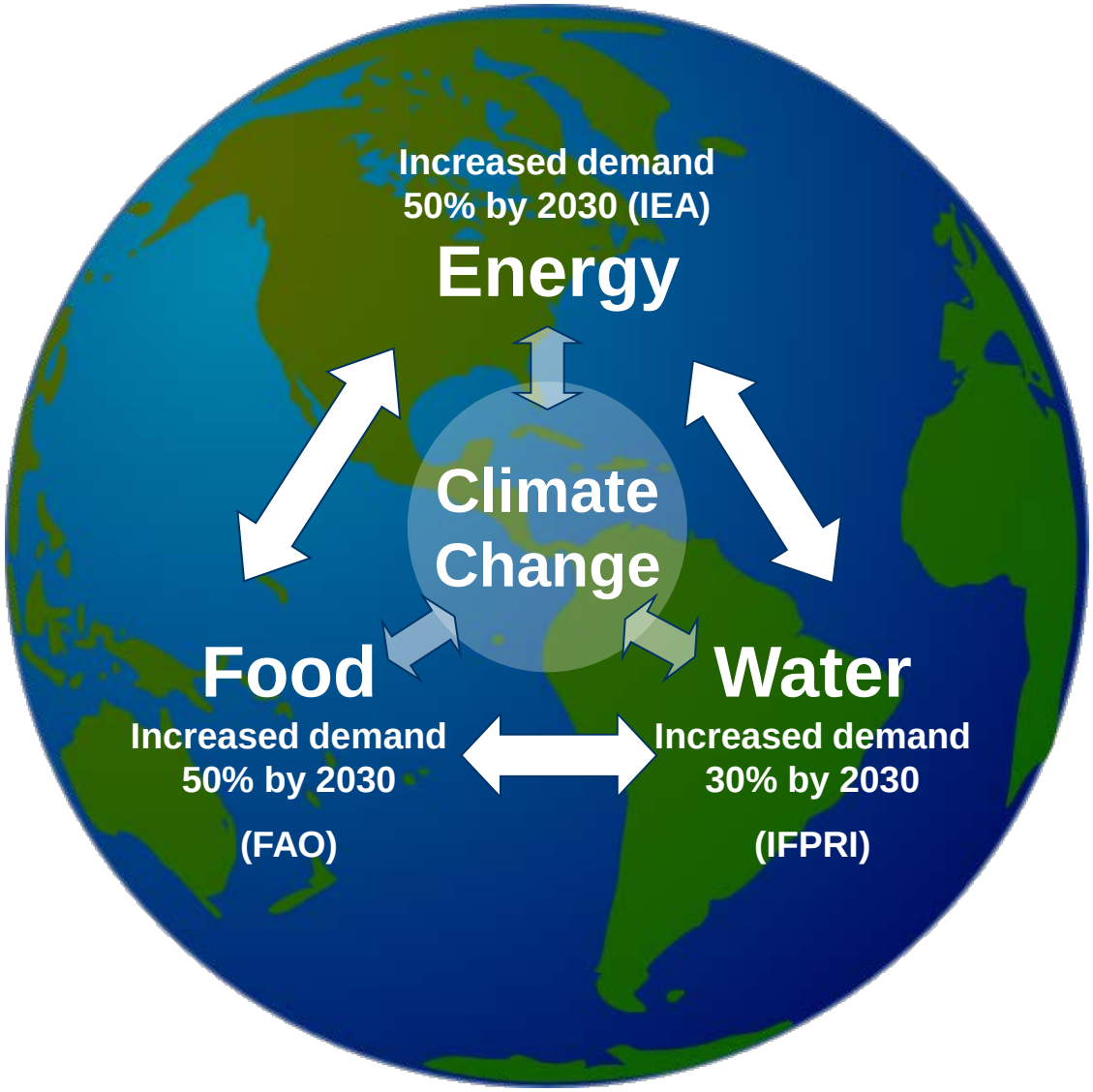
Lack of healthy food and proper nutrition affects every stage of life, trapping people in a cycle that passes hunger from one generation to the next.



MercyCorps

The perfect storm?

1. Increasing population
2. Increasing levels of urbanisation
3. The rightful goal to alleviate poverty



United Nations Secretary-General's Vision (2012)

ZERO HUNGER CHALLENGE

ZERO stunted children less than 2 years

100% access to adequate food all year round

ALL food systems are sustainable

100% increase in smallholder productivity and income

ZERO loss or waste of food

2025 : Target Year for Achieving Zero Hunger Challenge

Source: www.un.org

Forces that Shape the Food System in Asia and the Pacific Region

- Population growth coupled with rising living standards.
- Increasing urbanization and changing dietary habits.
- Declining land resources for agriculture and a growing scarcity of water resources.
- The threat of climate change.
- Rising food prices, rising energy prices and declining farm incomes.
- High levels of food losses and the growing problem of food waste

FOOD SECURITY: ASIA'S TWO FACES

A new Asian Development Bank study says that while Asia's economic growth and structural transformation deepen the complexity in managing limited natural resources for food security, many pockets of Asia continue to struggle with high levels of poverty and poor nutrition.

THE ASIA & THE PACIFIC REGION

BETWEEN 1990 & 2010, ECONOMIES GREW
AN AVERAGE OF 7.6% PER YEAR

ACCOUNTS FOR
ABOUT 60% OF GLOBAL POPULATION

WITH GROWING INCOMES AND MORE MOUTHS TO FEED, **THE REGION WILL CONSUME MORE & BETTER FOOD**

GROWING STEADILY, DESPITE POVERTY

ASIA'S FOOD CONSUMPTION *(PER CAPITA PER DAY)*

but...

SOME 733 MILLION PEOPLE in Asia & the Pacific still live in **absolute poverty** living on **LESS THAN $1.25/DAY**

UNDERNOURISHMENT REMAINS

OVER HALF A BILLION (ABOUT 14%)
of Asia's population are undernourished, more than all the undernourished in Africa

MORE THAN 40% OF CHILDREN
in several Asia & the Pacific countries are stunted

FOCUSING ON NUTRITION, RATHER THAN CALORIC INTAKE,
IS ESSENTIAL IF FOOD SECURITY IN THE REGION IS TO BE ACHIEVED

FOOD PRICE VOLATILITY

Any increase in food price slows the pace of poverty reduction, as the poor spend **UP TO 70% OF THEIR INCOMES ON FOOD**

Between 2001-2010 in Asia & the Pacific, **AN ADDITIONAL 112 MILLION PEOPLE COULD HAVE ESCAPED POVERTY** had food prices not increased

AN INCREASE OF 1 PERCENTAGE POINT in food price inflation could lead to...

0.2% INCREASE
in infant & child mortality

0.4% INCREASE
in prevalence of undernourishment

BUFFERING THE POOR FROM FOOD PRICE SPIKES

To reduce the vulnerability of poor households, the region's policymakers must consider the following:

Providing social safety nets such as **FOOD AID & CASH TRANSFER PROGRAMS**

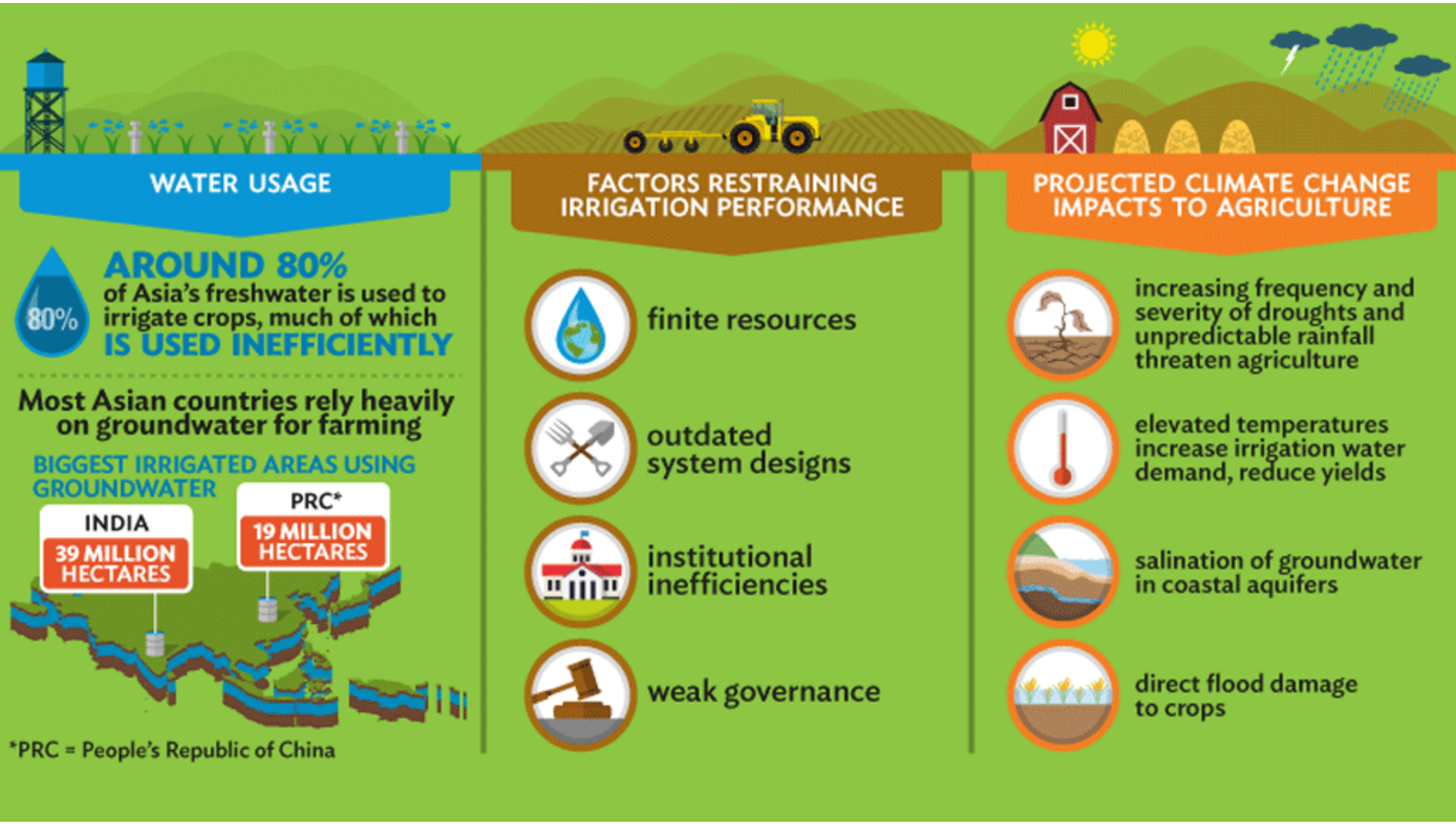
SETTING UP NATIONAL & REGIONAL FOOD RESERVES as buffers during shortages

ESTABLISHING EMERGENCY FUNDS & INSURANCE PRODUCTS to cushion against disasters

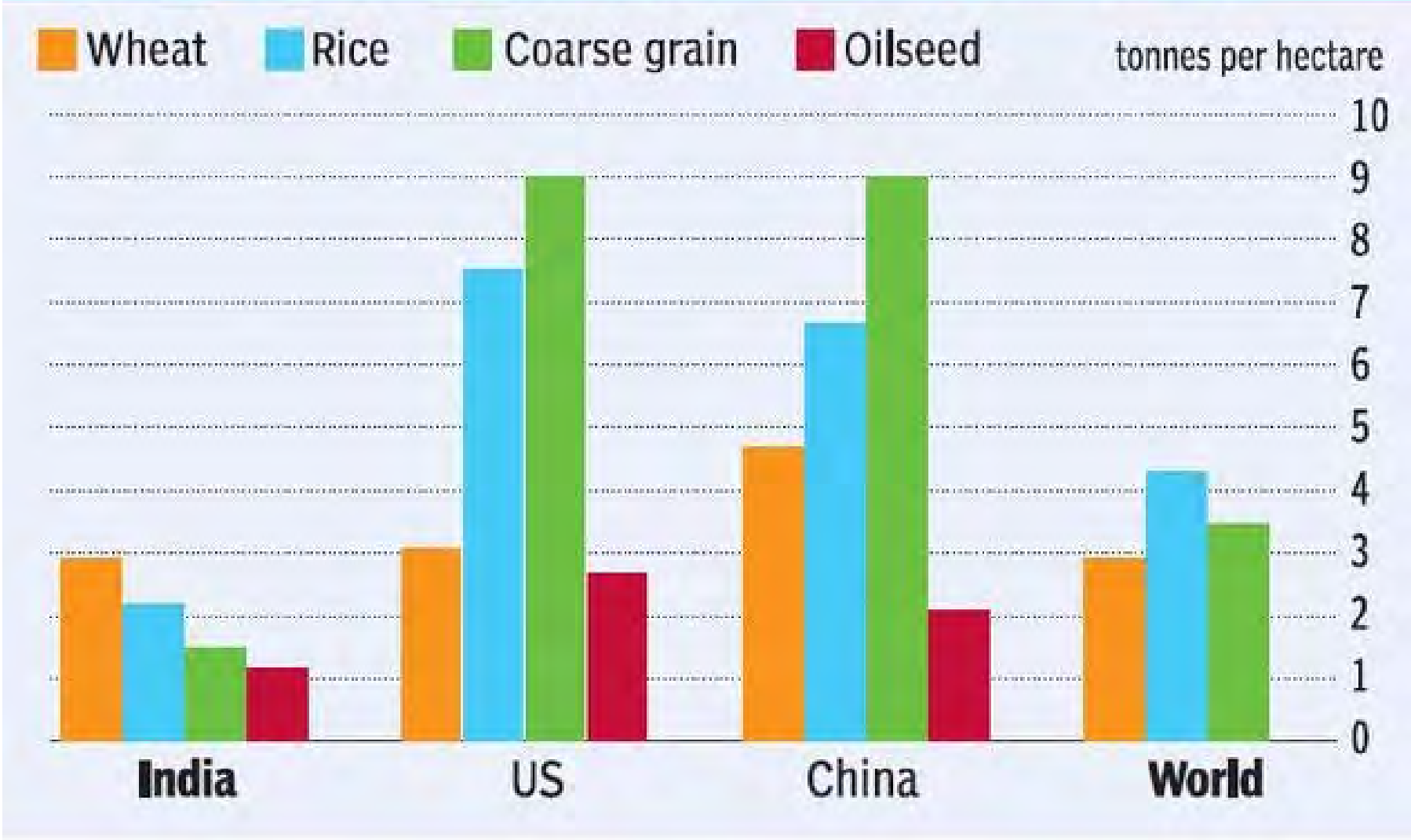
Implementing **FOOD TRADE LIBERALIZATION** measures

Investing in **AGRICULTURAL RESEARCH**

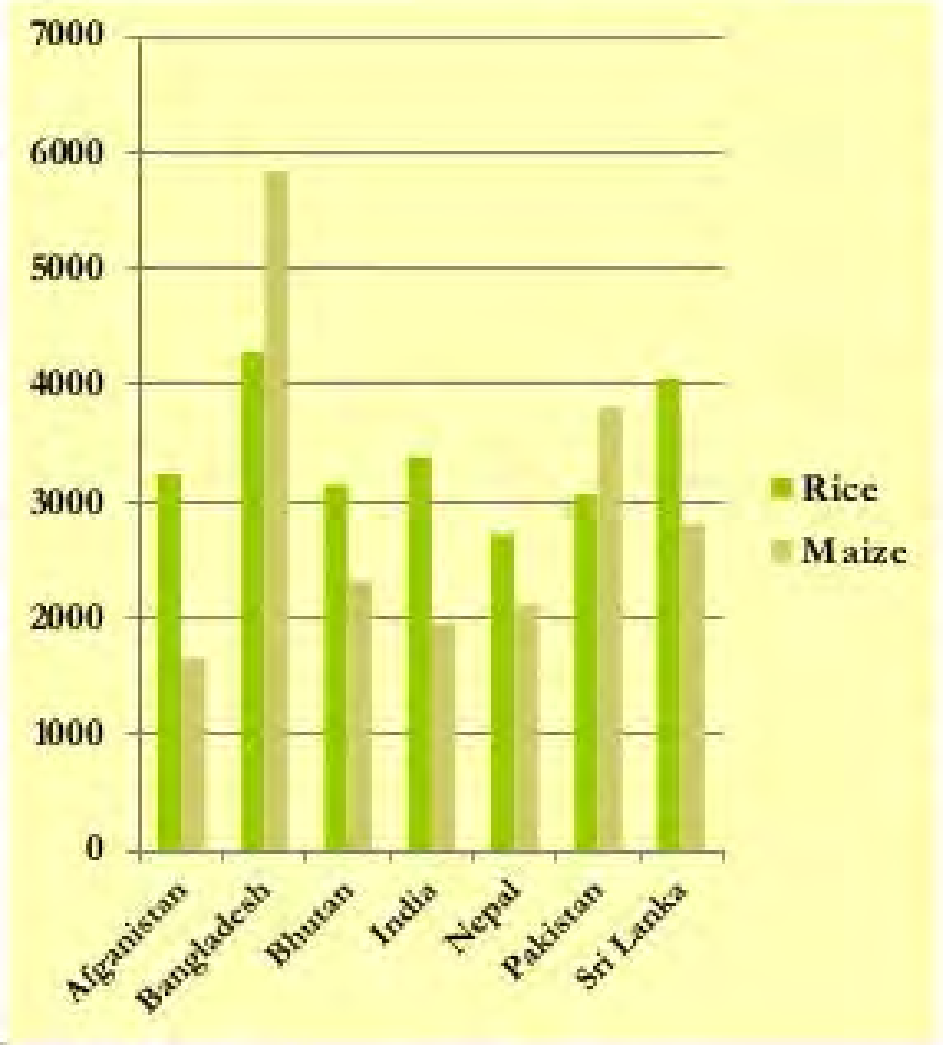
Challenges for Ensuring Agriculture Productivity

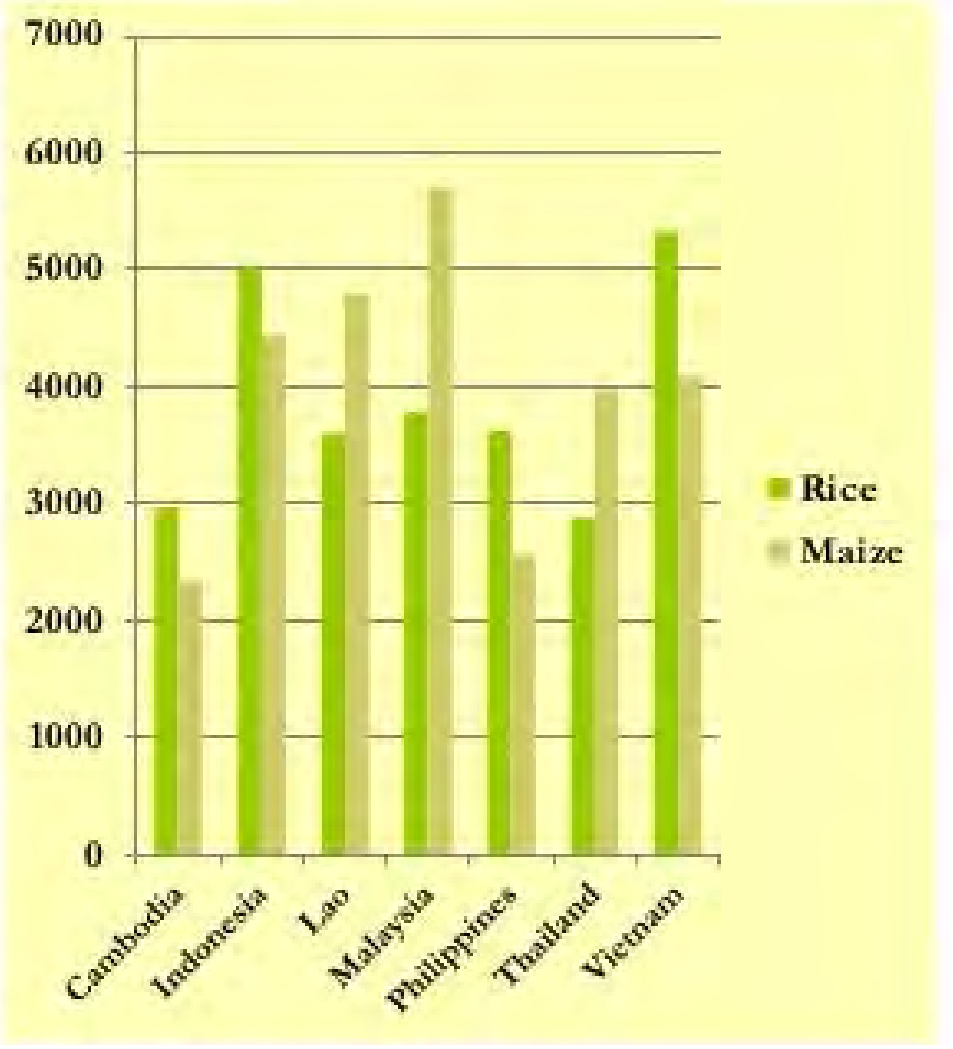


Comparative yield: India and the world

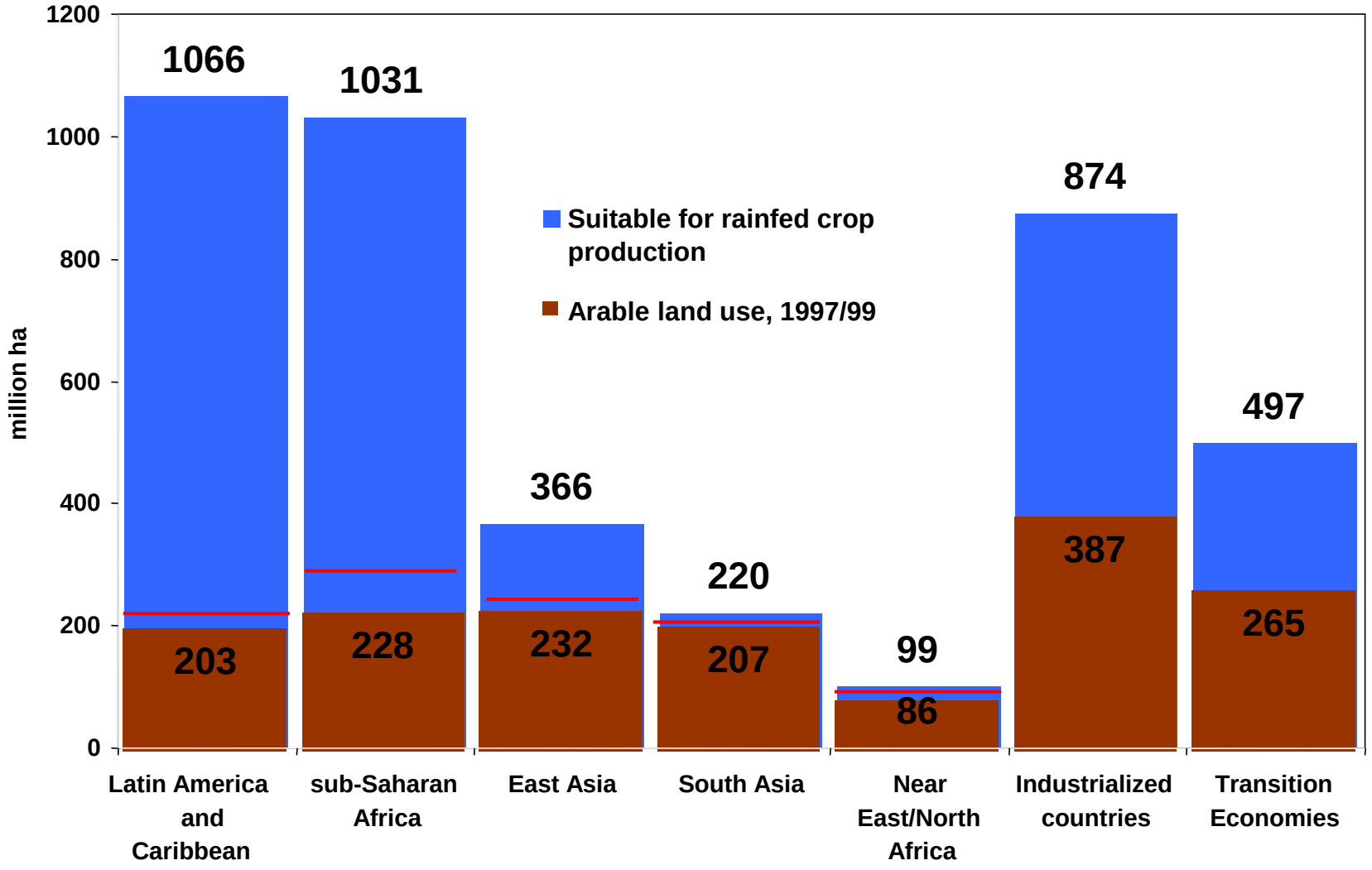


Yield of Rice and Maize in South and Southeast Asian Countries (kg/ha)





How much land is in use, how much is available now and in 2030?



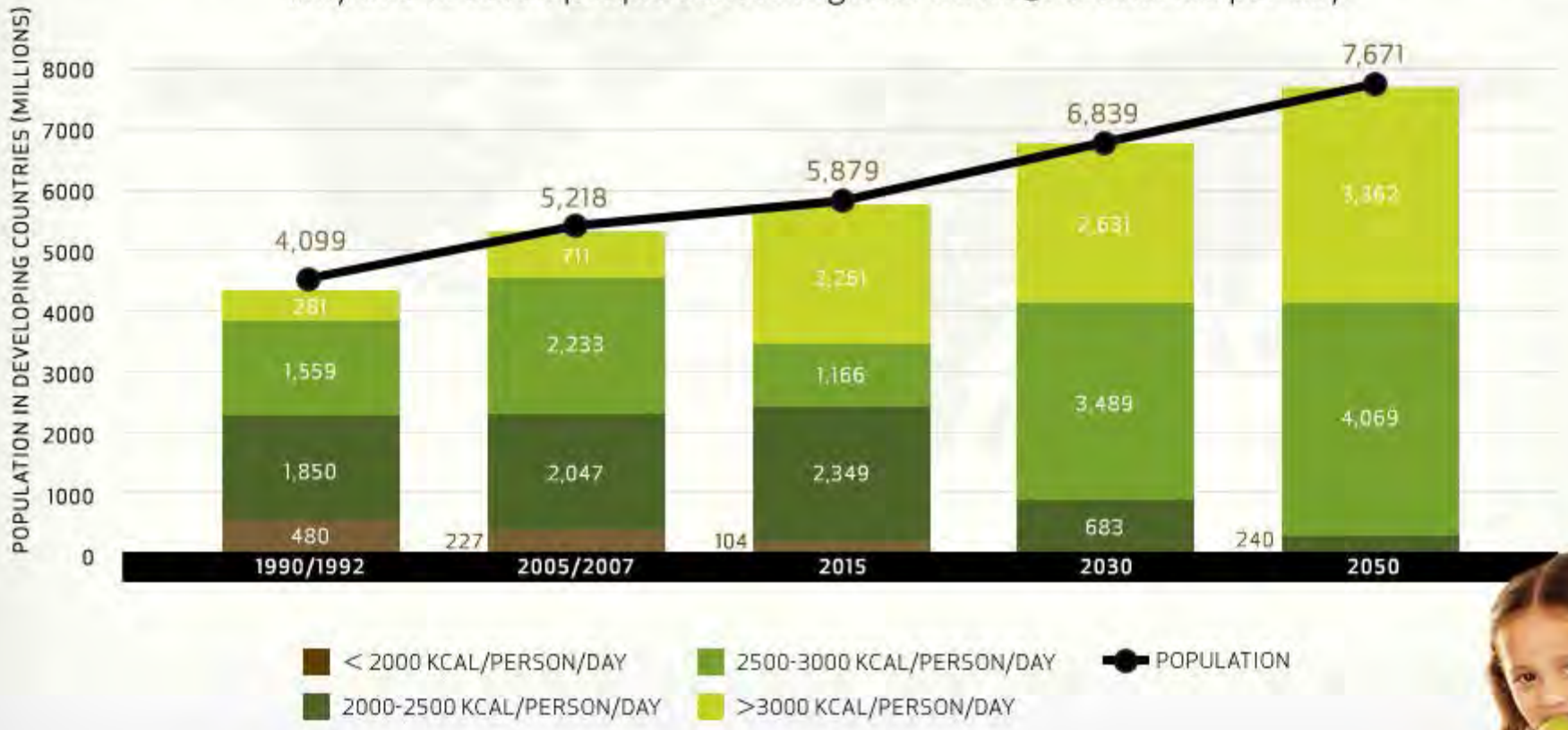
Source: Global Perspective Studies Unit, FAO

IMPACTS OF CLIMATE CHANGE

By 2030, nine out of ten major crops will experience reduced or stagnant growth rate, while average prices will increase dramatically due to climate change

PER CAPITA CONSUMPTION

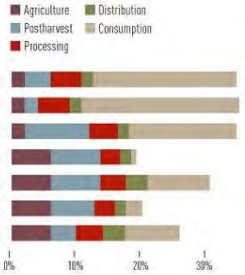
By 2030, average per capita food consumption in developing countries is expected to grow, with only one in seven people consuming less than 2500 calories per day.



30% CEREALS FOOD LOSSES

In industrialized countries, consumers throw away 286 million tonnes of cereal products.

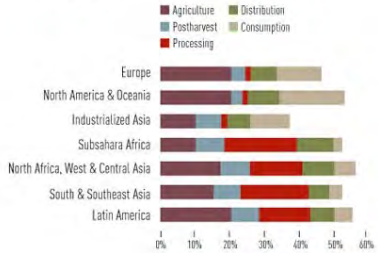
763 billion boxes of pasta



45% FRUIT & VEGETABLES FOOD LOSSES

Along with roots and tubers, fruit and vegetables have the highest wastage rates of any food products; almost half of all the fruit and vegetables produced are wasted.

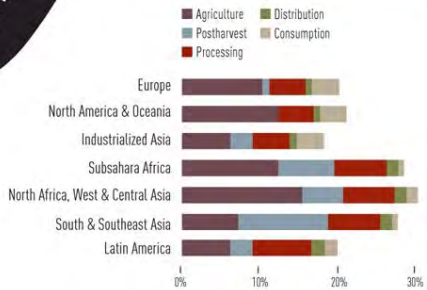
3.7 trillion apples.



20% OILSEEDS & PULSES FOOD LOSSES

Every year, 22% of the global production of oilseeds and pulses is lost or wasted.

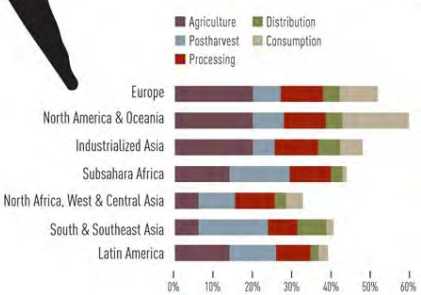
This is the same as the olives needed to produce enough olive oil to fill nearly 11,000 Olympic-sized swimming pools.



45% ROOTS & TUBERS FOOD LOSSES

In North America & Oceania alone, 5,814,000 tonnes of roots and tubers are wasted at the consumption stage alone.

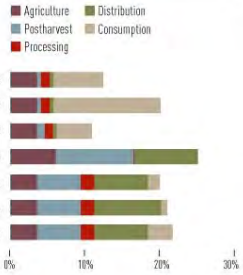
This equates to just over 1 billion bags of potatoes.



20% DAIRY FOOD LOSSES

In Europe alone, 29 million tonnes of dairy products are lost or wasted every year.

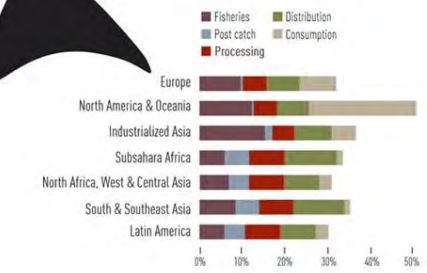
This is the same as 574 billion eggs.



30% FISH & SEAFOOD FOOD LOSSES

8% of fish caught globally is thrown back into the sea.In most cases they are dead, dying or badly damaged.

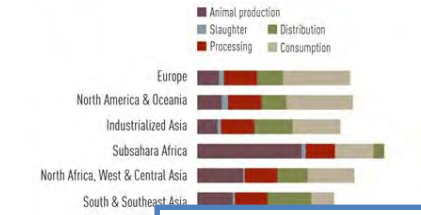
This is equal to almost 3 billion Atlantic salmons.



20% MEAT FOOD LOSSES

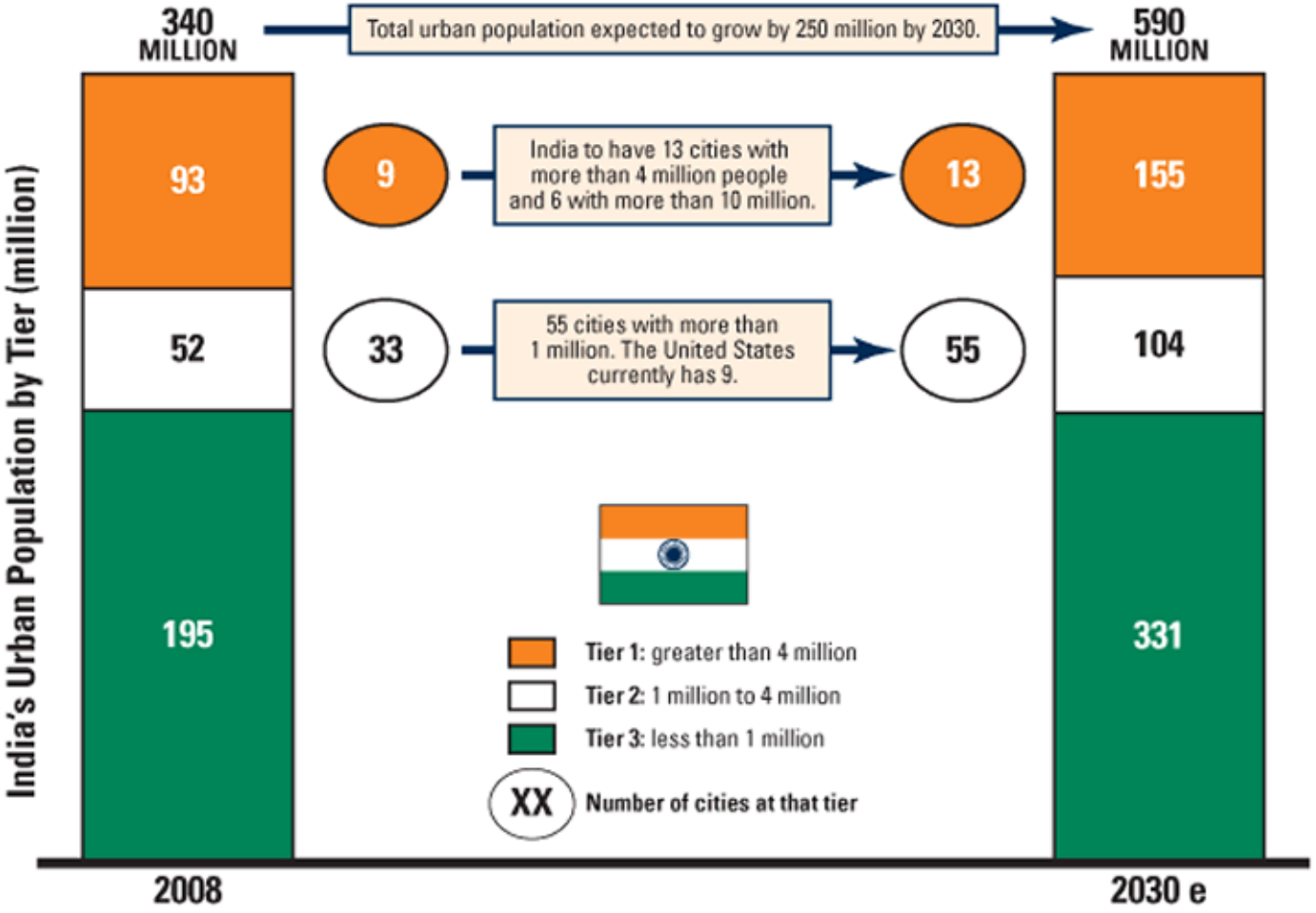
Of the 263 million tonnes of meat produced globally, over 20% is lost or wasted.

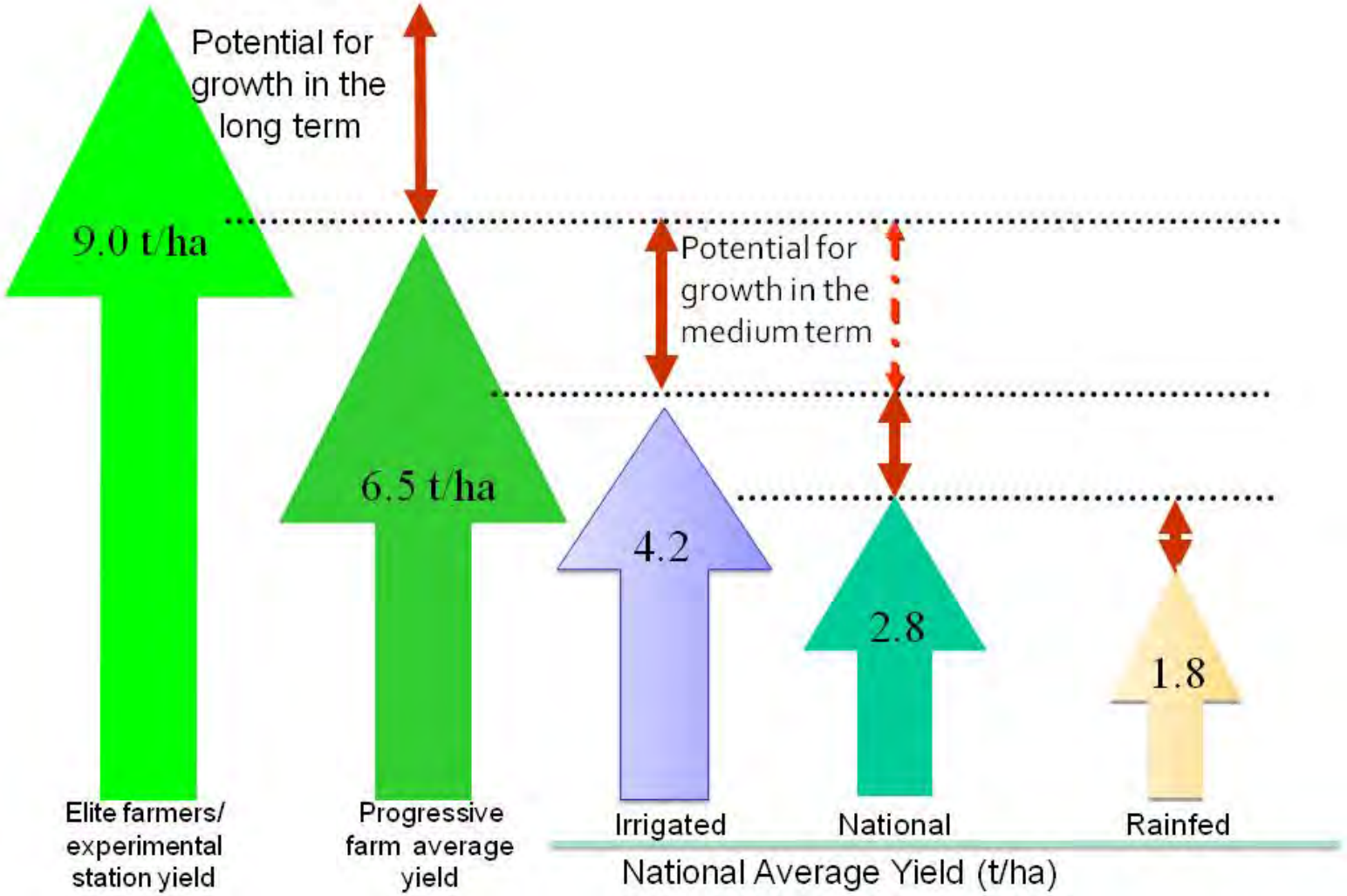
This is equivalent to 75 million cows.



FAO 2013

India's Future Is In Its Cities




Potential for growth in the long term
9.0 t/ha
Potential for growth in the medium term
6.5 t/ha
4.2
2.8
1.8
Elite farmers/ experimental station yield
Progressive farm average yield
Irrigated
National
Rainfed
National Average Yield (t/ha)

Four dimensions of food security

Availability

- domestic production
- import capacity
- food stocks
- food aid

Access

- poverty
- purchasing power
- transport and market infrastructure
- food distribution

Stability

- weather variability
- price fluctuations
- political factors
- economic factors

Utilization

- food safety & quality
- clean water
- health & sanitation

According to current stats…

1 billion insufficient kcals and nutrients (hunger)

2 billion sufficient kcals, but insufficient nutrients (hidden hunger)

3 billion sufficient kcals and nutrients (healthy)

1.4 billion excess kcals (some with insufficient nutrients) (overweight/obesity)

Asia has largest concentration of undernourished population in the world (million)

	1990-92	2010-12
World	1000	868
Africa	175	239
Asia	739	565
S Asia	327	304
SE Asia	134	65

- Asia in the world
  - *74% in 1990-92 to 65% now*
  - *27% in Africa*
- South Asia in world
  - *33% in 1990-92 to 35% now*
- Southeast Asia in world
  - *14% in 1990-92 to 7% now*
- South Asian countries
  - *High economic growth*
  - *Poor agriculture*

Acute Undernourishment in SAARC Countries

Country	Under-nourished (%)	Child malnourishment, %		Low birth weight (%)	Anemic children (%)
		Underweight	Stunted		
Bangladesh	26.0	41.3	43.2	22	47
India	22.0	43.5	47.9	28	74
Nepal	16.0	38.8	49.3	21	48
Pakistan	23.0	31.1	41.5	32	51
Sri Lanka	21.0	21.1	17.3	18	30
South Asia	22.0	41.1	46.4	27	74

Malnutrition in ASEAN Countries

Country	Undernourished population (%)	Underweight children, %	Child mortality rate, %
Cambodia	25	29	5.1
Indonesia	13	20	3.5
Lao PDR	22	32	5.4
Malaysia	2	13	0.6
Philippines	13	21	2.9
Thailand	16	7	1.3
Vietnam	11	20	2.3

The future growth in agriculture must, therefore, come from:-

- new technologies which are not only "cost effective" but also "in conformity" with the natural climatic regime of the country;
- technologies relevant to rain-fed areas and small farms
- continued genetic improvements for better seeds and yields;
- data improvements for better research, better results, and sustainable planning;
- bridging the gap between knowledge and practice;
- judicious land use, efficient management practices and sustainable use of natural resources.
- Necessary policy and public support

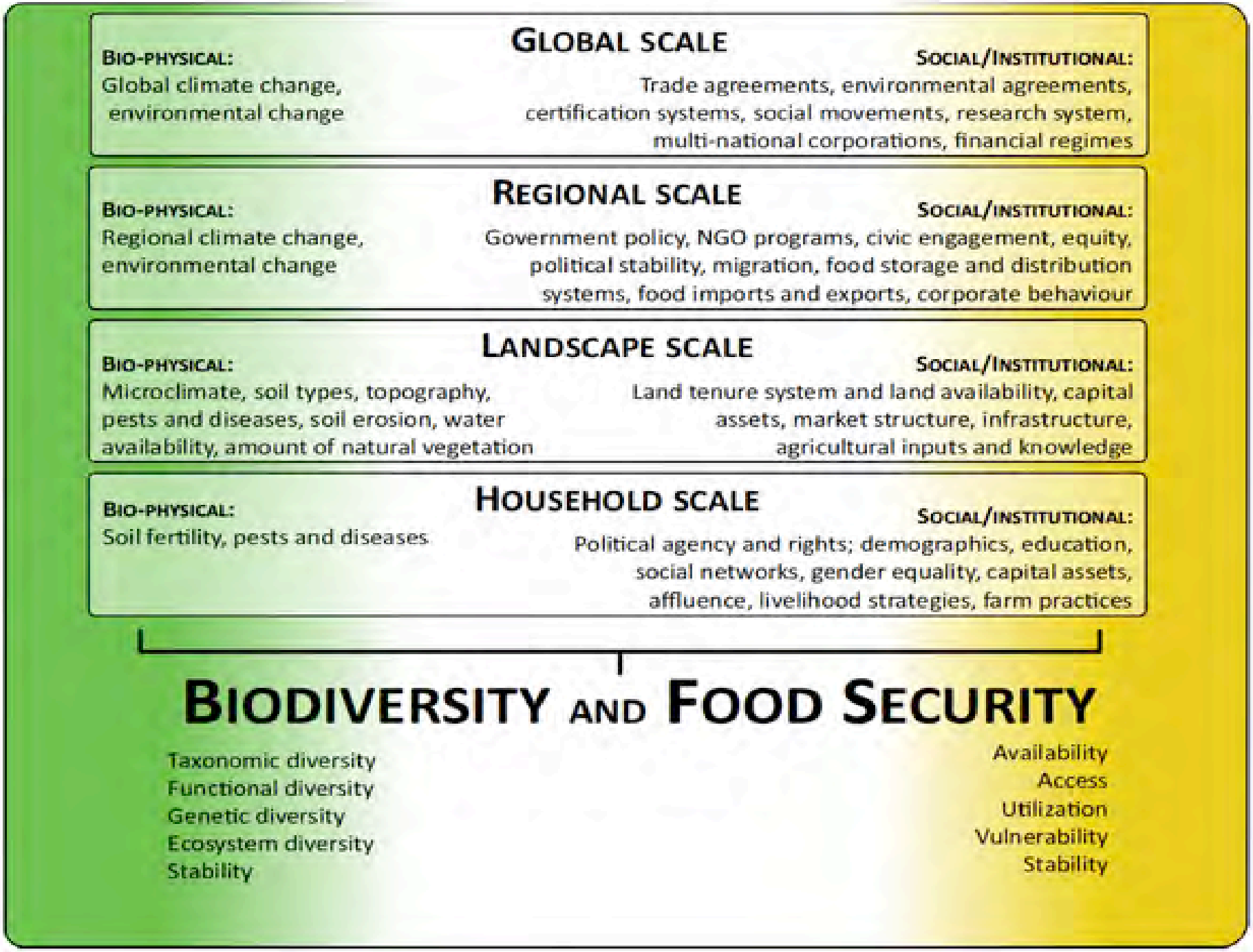
Food and Nutrition security should be at the top of our agenda

- We need solutions that bridge the incredible potential from interdisciplinary research: engineering, nutrition, food science, economics, agril. sci., extension, social work, community development, natural resources, and informatics
- Advances in diagnostic technologies should provide the critical data to assess progress, identify actions, improve accountability

PRIORITIES

- Focus on Low productivity and high potential areas
- Cropping system approach than individual crop
- Agro-climatic zone planning and cluster approach
- Pulse production using of rice fallow, intercropping
- Promotion & extension of improved technologies
- Input use efficiency and resource conservation
- Post-harvest, value chain and marketing support
- Capacity building of the farmers

Diversity is key to Sustained Growth

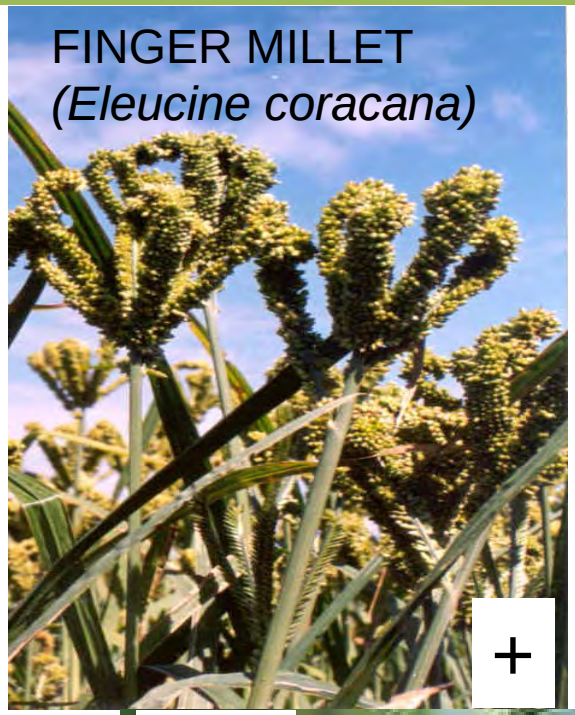

GLOBAL SCALE
BIO-PHYSICAL:
Global climate change, environmental change
SOCIAL/INSTITUTIONAL:
Trade agreements, environmental agreements, certification systems, social movements, research system, multi-national corporations, financial regimes
REGIONAL SCALE
BIO-PHYSICAL:
Regional climate change, environmental change
SOCIAL/INSTITUTIONAL:
Government policy, NGO programs, civic engagement, equity, political stability, migration, food storage and distribution systems, food imports and exports, corporate behaviour
LANDSCAPE SCALE
BIO-PHYSICAL:
Microclimate, soil types, topography, pests and diseases, soil erosion, water availability, amount of natural vegetation
SOCIAL/INSTITUTIONAL:
Land tenure system and land availability, capital assets, market structure, infrastructure, agricultural inputs and knowledge
HOUSEHOLD SCALE
BIO-PHYSICAL:
Soil fertility, pests and diseases
SOCIAL/INSTITUTIONAL:
Political agency and rights; demographics, education, social networks, gender equality, capital assets, affluence, livelihood strategies, farm practices
BIODIVERSITY AND FOOD SECURITY
Taxonomic diversity
Functional diversity
Genetic diversity
Ecosystem diversity
Stability
Availability
Access
Utilization
Vulnerability
Stability

Technology Intervention for Productivity Enhancement

Bioindustrial Watershed as Growth Engine for Sustainable Development

We can harness the potential of watershed development as growth engine for sustainable development and improving livelihoods in rainfed India. It calls for concerted efforts, collective action and change in mindset of all stakeholders

CLIMATE SMART NUTRITIOUS MILLETS



Proso Millet
Panicum miliaceum

Kodo millet
Paspalum scrobiculatum

\+ indicates the drought hardiness

PULSES AND CLIMATE CHANGE

Climate change: a threat to food security

Whether in the form of droughts, floods or hurricanes **climate change impacts every level of food production.**

Climate change puts **global food security at risk** and **heightens the dangers of undernutrition in poor regions.**

FOOD PRODUCTION AND **CLIMATE CHANGE**

Food production, food security and climate change are intrinsically linked.

The changing climate will continue to put pressure on agricultural ecosystems, **particularly in regions and for populations that are particularly vulnerable.**

Introducing pulses into crop production can be key to increasing resilience to climate change.

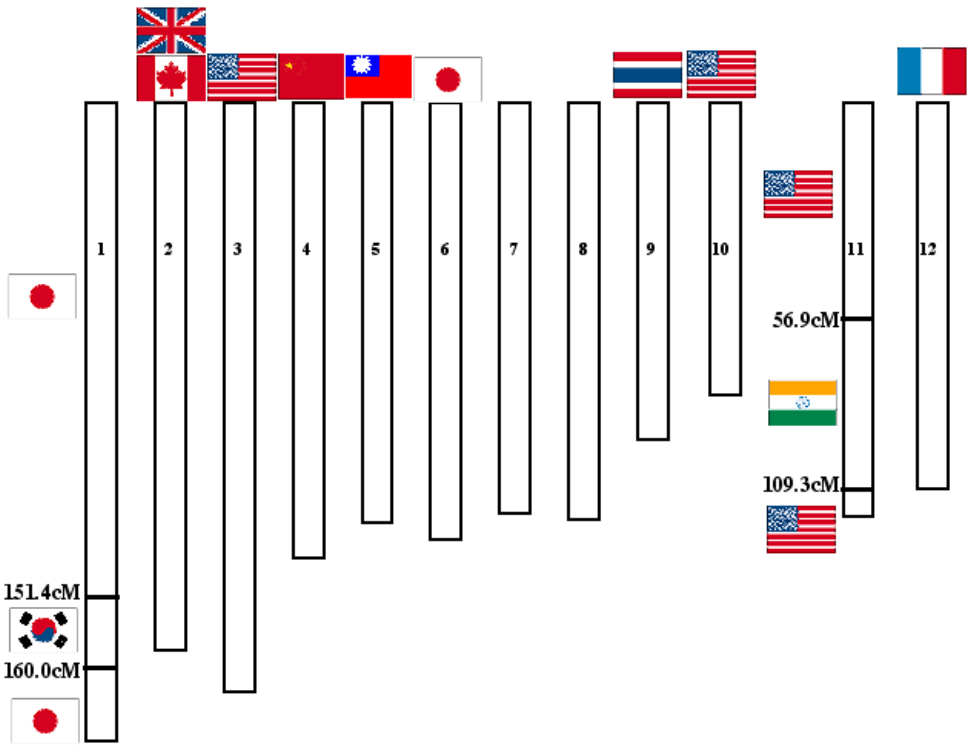
Integrated Intensive Farming System Models

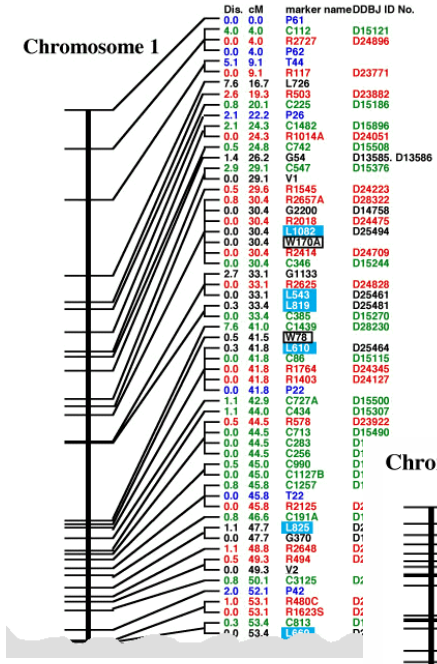
Faidherbia albida: The Fertilizer Tree

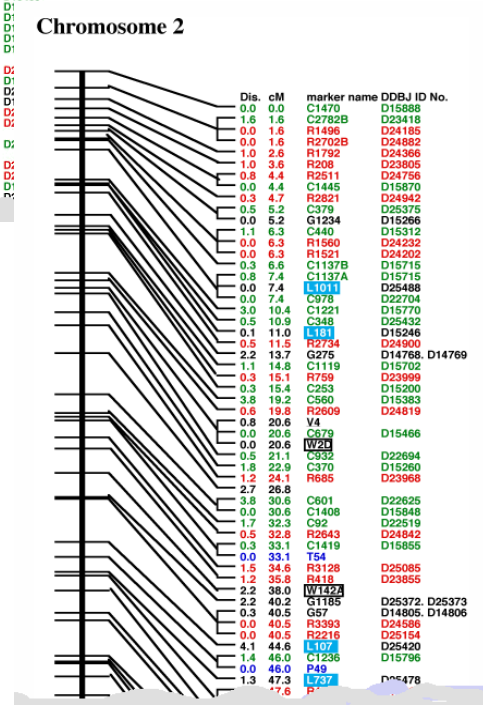
What would be the impact if African farmers deployed Evergreen Agriculture on a much larger scale?

If practiced on:	**5 m ha**
Value of nitrogen fertilizers produced by farmers	**500 m/yr**
Amount of additional maize produced	**5-10 m tons**
Value of additional maize produced	**$ 1-1.5 billion**

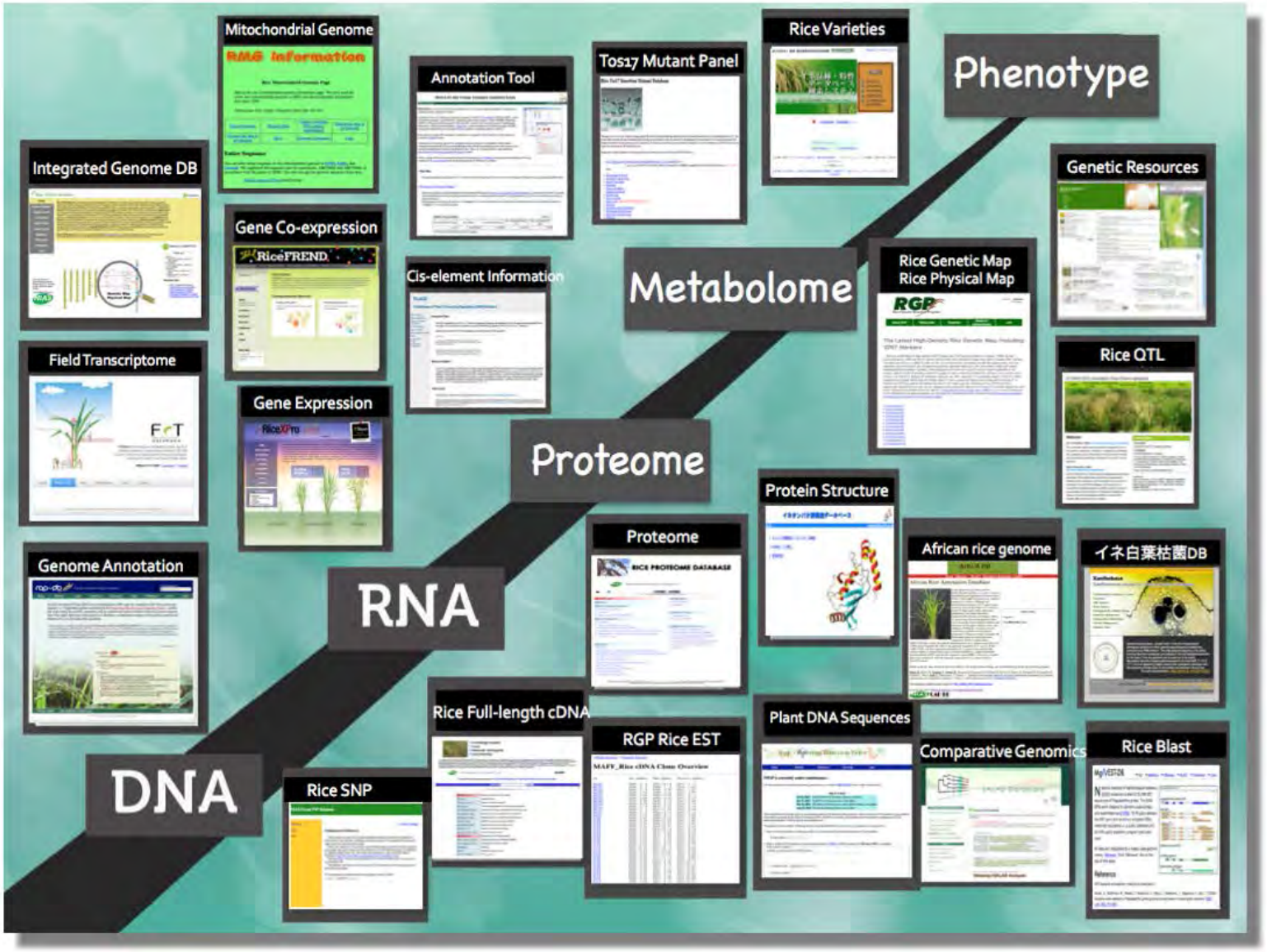
Genomics and Molecular Genetics

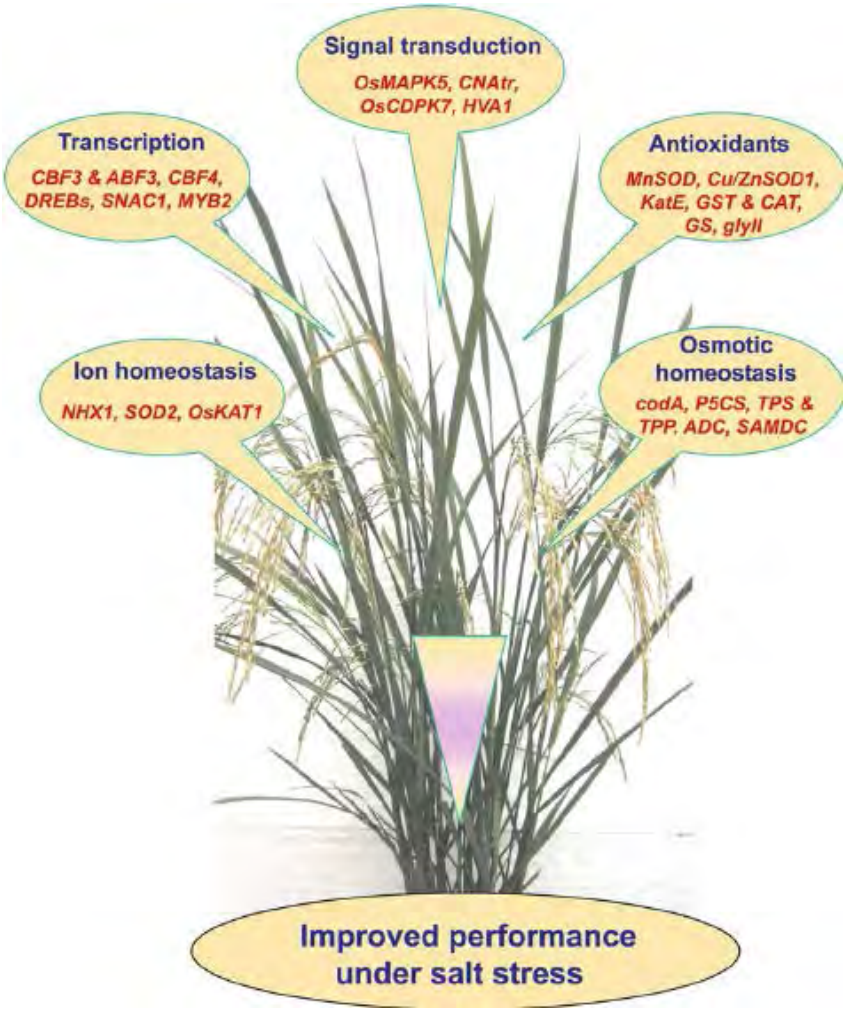


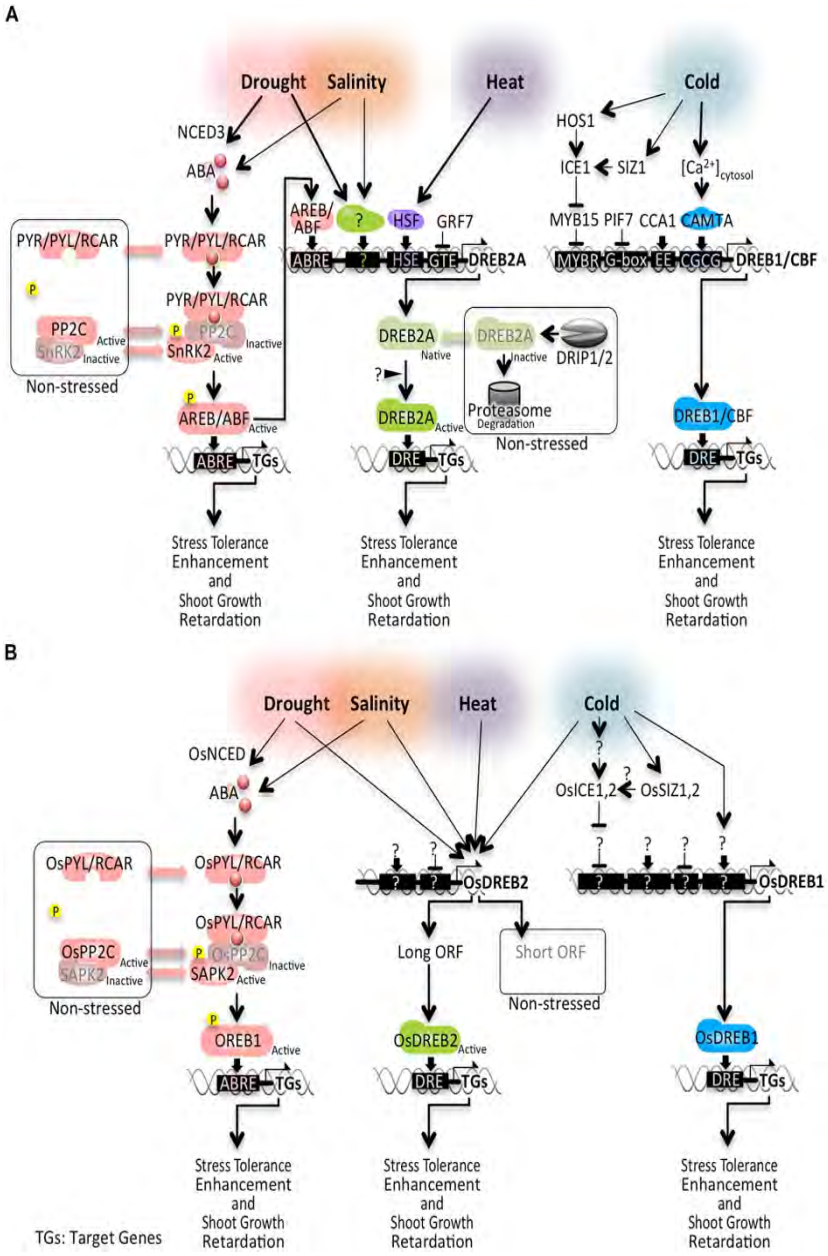




Genomic Resources for Rice




Signal transduction
OsMAPK5, CNAtr, OsCDPK7, HVA1
Transcription
CBF3 & ABF3, CBF4, DREBs, SNAC1, MYB2
Antioxidants
MnSOD, Cu/ZnSOD1, KatE, GST & CAT, GS, glyII
Ion homeostasis
NHX1, SOD2, OsKAT1
Osmotic homeostasis
codA, P5CS, TPS & TPP, ADC, SAMDC
Improved performance under salt stress


A
Drought
Salinity
Heat
Cold
NCED3
ABA
HOS1
ICE1
SIZ1
[Ca2+]cytosol
MYB15
PIF7
CCA1
CAMTA
AREB/ABF
HSF
GRF7
PYR/PYL/RCAR
PP2C
SnRK2
ABRE
HSE
GTE
DREB2A
MYBR
G-box
EE
CGCG
DREB1/CBF
Non-stressed
Native
Inactive
DRIP1/2
Proteasome
Degradation
AREB/ABF
DRE
TGs
Stress Tolerance Enhancement and Shoot Growth Retardation
B
OsNCED
OsICE1,2
OsSIZ1,2
OsPYL/RCAR
OsPP2C
SAPK2
OsDREB2
OsDREB1
Long ORF
Short ORF
OREB1
TGs: Target Genes

Source: *FAO, ITU*

Transforming Agriculture will require a Big Jump

The Way Forward

- Through the use of science based technologies, improved practices and forward looking policies, we can meet the growing demand for food, feed, fiber and fuel while
  - CONSERVING land, water, energy and other limited resources,
  - ADAPTING to changing dietary patterns and climatic conditions, and
  - IMPROVING the livelihoods and living conditions of urban and rural communities and smallholder farmers.
  - Developing sustained partnerships for A4D

A new approach for Managing the Challenges

1. **Invest in two core pillars: Agriculture and social protection**
2. **Bring in new players, technology, practices**
3. **Adopt a community-led, bottom-up approach**
4. **Design policies using evidence and Science and Technology**
5. **Walk the talk**

We can do it!; We must do it!

THANK YOU FOR YOUR ATTENTION